REMARKS

This is a full and timely response to the final Office action mailed October 21, 2005. This response is filed within two-months of the mailing date of the final action. Reexamination and reconsideration in view of the foregoing amendments and following remarks is respectfully solicited.

Claims 1, 2, 5-7, 9-12, 14-16, 18-23, 25, 26, 28-31, 33, 34, 36-38 are pending in this application, with Claims 1, 12, 21, 31 being the independent claims. Claim 1 has been amended. No new matter is believed to have been added.

Rejections Under 35 U.S.C. § 102

Claims 1, 2, 5-7, 9, 10, 12, 14, 18, 19 21-23, 28, 29, 31, 36 and 37 were rejected under 35 U.S.C. § 102 as allegedly being anticipated by U.S. Patent No. 6,098,011 to Scott, hereinafter Scott. The Examiner stated that Scott discloses a fault detection system for detecting faults in an aircraft system, where the fault detection system includes a sensor data processor providing an augmented data set and a logic inference system, the logic inference system analyzing the augmented data set to determine the likelihood that a fault has occurred.

In the first office action, the Examiner cited errors 28 and 38, described in column 3, lines 1-65 of Scott, in stating that Scott teaches a system that determines a likelihood that a fault has occurred. Applicants disagreed and submitted that the amended claims were patentably distinct. Specifically, applicants argued that the claimed invention is directed toward a system and method of detecting fault in a turbine engine. As such, the system and method receives sensor data from the turbine engine, and uses that sensor data to determine the likelihood that a fault has occurred in the turbine engine. In contrast, the applicants argued that the fuzzy logic system described in Scott is not for fault detection. The applicants argued that instead, the system described in Scott is used to arbitrate between two sensed values (citing the abstract Scott). Furthermore, the applicants argued

that as described in Scott, the system is used to determine a single value for sensor from multiple sensors. The applicants cited column 3, lines 52-62 of Scott, which describes how the system is operable to generate a single output value from multiple sensors. The applicants thus argued that the resulting output in Scott is then submitted to the primary engine control algorithms for processing. For example, the output is used in the control of actuators on the engine. See FIG. 1 of Scott, as one example. Thus, the applicants argued that system described in Scott is not a fault detection system, nor is it in any way used to determine the likelihood of a fault in a turbine engine.

In response to these arguments, the Examiner issued a final office action dated October 21, 2005. In this final office action the Examiner maintained the previously made rejection. In rejecting applicants' arguments, the Examiner stated that Scott at columns 2 and 3 discloses sensing many parameters in a turbine engine, where each parameter of the many parameters is sensed by two sensors. The Examiner then alleged that when there is a difference in the sensed parameter between the two sensors, then a likelihood of a fault in the turbine engine is known to occur. Furthermore, the Examiner stated that the magnitude of the error is determined by making reference to a table of stored data, and afterward a decision is made based on the magnitude of the error sensed.

Applicants again disagree, and submit that the Examiner is again mischaracterizing the Scott reference failing to give full weight to the limitations in applicants' claims. Again, applicants submit that the Scott reference teaches a fault accommodation control system to accommodate faults in turbine engine sensors. However, it does not teach a fault detection system to detect faults within the turbine engines themselves.

Regarding the Examiner's specific allegations in the Final Office Action, the fact that columns 2 and 3 disclose sensing many parameters is irrelevant if those parameters are not used to detect faults in the turbine engine.

Furthermore, the Examiners hypothesis that when "there is a difference in the sensed parameter between the two sensors, then a likelihood of a fault in the turbine engine is known to occur" is also irrelevant because fuzzy logic system of Scott fails to use that difference to determine the likelihood of a fault.

Finally, the Examiner's statement that the "magnitude of the error is determined by making reference to a table of stored data, and afterward a decision is made based on the magnitude of the error sensed" is also irrelevant because the decision made is not a decision of "detecting a fault". Instead, the decision made from a table determines how to use the sensed values—*e.g.*, whether to use an average of sensed values, the higher of the sensed values, or the lower the sensed values. See column 3, line 59 to column 4, line 13 of Scott.

Furthermore, the alleged "errors" determined Scott are not determined by fuzzy logic system—they are instead used as inputs to that system. Again, applicants submit that FIG. 2 of Scott clearly shows a system where the difference between two sensor values is calculated by the comparator 24, an absolute value of the difference is generated by absolute value operator 26. The output of the absolute value operator 26 is defined as "first signal 28 which is the absolute value of the difference between sensors A and B." This difference signal is referred to as the "first error 28". See column 2, line 62 to column 3, line 3 of Scott. That first error 28 is then used as an **input** to the fuzzy logic algorithm 40. The first error 28 is not an **output** from the fuzzy logic algorithm 40 indicating an error, as was alleged by the Examiner. Thus, the first error 28 is not the result of a fuzzy logic system analyzing "the augmented data set to determine a likelihood that a fault has occurred in the turbine engine" as recited in applicants' amended claim 1.

Instead, the first error 28 is used with the second error 38 as **inputs** to the fuzzy logic algorithm 40, which in turn generates a numerical output 42 that represents "the

graded memberships of the first error 28 and the second error 38 as determined by the fuzzy logic look up table 40". See column 4, lines 25-28 of Scott. These graded memberships are then used to generate a "preselected weighted average of the two sensed values". See column 4, lines 33-35 of Scott. Specifically, the portion 48 uses the graded memberships to "to create a single output value 58 for use as the compressor discharge pressure parameter in question". See column 4, lines 33-44 of Scott.

Thus, the **output** of the fuzzy logic algorithm 40 in Scott is used generate **a single output value for the parameter in question.** The fuzzy logic algorithm 40 in Scott is **not** used to analyze an augmented data set to "determine a likelihood that a fault has occurred in the turbine engine" as recited in applicants amended claim 1, and similarly recited in claims 12, 21 and 31.

Furthermore, the Examiner has failed to address several significant limitations in the independent claims. For example, amended independent claim 1 recites that the sensor data processor augments the sensor data by "generating residuals from the sensor data and determining a rate of change of the residuals". Claim 12 recites similar limitations of "determining the slope of the residuals". Claims 21 and 31 include similar limitations. In the office action, the Examiner failed to specifically address the limitation of "generating residuals" and "determining a rate of change of the residuals". Applicants can find no teaching of "determining a rate of change of the residuals" and using the rate of change as part of an augmented data set which is fuzzified and analyzed to determine a likelihood that a fault has occurred in the engine.

For all these reasons, applicants submit that amended independent claims 1, 12, 21 and 31 are patentably distinct over Scott. Furthermore, as claims 2, 5-7, 9-11 depend from and include all the limitations of claim 1, claims 14-16, 18-20 depend from and include all the limitations of claim 12, claims 23, 25, 26, 28-30 depend from and include all the limitations of claim 21 and claims 33, 34, 36-38 depend from and include all the

limitations of claim 31, they are also submitted to be patentably distinct over the cited references.

Furthermore, many of the dependent claims include limitations not found in Scott. For example, claim 2 recites that the sensor data processor "augments the sensor data by determining **a rate of change** of the sensor data". Applicants can find no specific teaching determining a rate of change of the sensor data and using the rate of change as part of an augmented data set which is fuzzified and analyzed to determine a likelihood that a fault has occurred in the engine. Applicants note that the Examiner failed to reference any specific portion of Scott as teaching this feature.

With regard to claim 10, claim 10 recites that fuzzy logic inference system further aggregates outputs of the plurality of rules and defuzzifies the aggregated output for input into **a diagnostic system**. Applicants can find no teaching of any aggregated output of the fuzzy logic system into a **diagnostic system**. Claims 18, 29 and 36 include similar limitations, and claims 11, 19, 30 and 37 depend from these claims. Applicants again note that the Examiner failed to reference any specific portion of Scott as teaching this feature.

Rejections Under 35 U.S.C. § 103

Claims 11, 15, 16, 20, 25, 26, 30, 33, 34 and 38 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Scott in view of Ling (U.S Patent No. 5,718,111). In this rejection, the Examiner admitted that Scott did not disclose the use of specifically recited sensors in those claims. However, the Examiner then stated that Ling discloses the use of these sensors in a turbine engine. Applicants respectfully disagree. While Ling does teach the use of the various sensors, applicants submit that Ling, like Scott, fails to teach the use of these sensors in a fault detection system used to determine the likelihood that a fault has occurred in the turbine engine. Thus, applicants again submit that the independent claims are patentably distinct over the cited references.

Conclusion

Based on the above, independent Claims 1, 11, 21 and 31 are patentable over the citations of record. The dependent claims are also submitted to be patentable for the reasons given above with respect to the independent claims and because each recite features which are patentable in its own right. Individual consideration of the dependent claims is respectfully solicited.

The other art of record is also not understood to disclose or suggest the inventive concept of the present invention as defined by the claims.

Hence, Applicant submits that the present application is in condition for allowance. Favorable reconsideration and withdrawal of the objections and rejections set forth in the above-noted Office Action, and an early Notice of Allowance are requested.

If the Examiner has any comments or suggestions that could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the below-listed number.

If for some reason Applicant has not paid a sufficient fee for this response, please consider this as authorization to charge Ingrassia, Fisher & Lorenz, Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

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